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PROBLEMS FOR ZOOLOGISTS.

BY J. S. KINGSLEY.

MR. S. H. Scudder in his address before the Entomological Section at the Boston meeting of the American Association for the Advancement of Science, presented some of the problems which the entomologist has yet to solve, and acting upon the hint which his article affords, I would here state some of the questions in other departments of zoölogy which are as yet unanswered. Throughout our land there are several hundred people who are greatly interested in zoölogy, but the greater portion of them through lack of guidance and through misdirected efforts, add nothing to the stock of scientific knowledge which the world possesses. On the shoulders of a few falls all of the original investigation done in America to-day. It is to that larger class who are willing to work, but who do not know how to work, or what to work upon, that this article is addressed. Some of the problems are simple, needing only a slight amount of experience, and a moderate amount of skill, while others require for their elucidation the trained investigator. To state all the problems requiring solution, would take more space than is contained in a volume of this magazine; a few only, therefore, are presented.

Hermann Fol has recently described the effects produced upon the eggs of star-fishes when two or more spermatozoa enter it at the same time. An abnormal segmentation ensues, proceeding from two or more centers, and resulting in a compound gastrula. This would suggest a possible explanation of the cause of double monsters, and assign an answer for a much vexed question in teratology. A single fact is but a slender foundation for generalizations of this character, and hence observations are needed to ascertain whether in other groups a multiple impregnation produces a compound gastrula, and if so, what the gastrula in turn produces.

The eggs of a few animals have been studied while becoming mature, and when the impregnation was taking place, and with wonderful results. Yet but a very few forms have thus been studied, and detailed accounts of the phenomena of the maturation and impregnation of eggs are needed in almost every group. The eggs of the larger proportion of the animal kingdom in becoming mature form what are known as polar globules. With the possible exception noted by Grobben, these polar globules

have not been found in the eggs of insects and crustacea, but our information on this point is still of a negative character, and new and careful investigation may conclusively show that the Arthropoda in this respect do not form an exception to the rule that the extrusion of polar globules is one of the features of the maturation of the eggs of all animals.

Grobben when studying the development of a small fresh-water crustacean *(Moina)*, found that certain cells, which eventually formed the genital organs, were differentiated at nearly the same time as the epiblast and hypoblast. Metchnikow has also found in an insect that the reproductive organs were very early developed. When we consider that the chief end and purpose of every animal is the reproduction of its kind, this early appearance of the genital organs is what should be expected, but as yet, so far as I am aware, these two observations stand alone. Here is possibly a fruitful field for some ardent student.

In the waters of the whole eastern United States (with the exception of New England), and the Mississippi basin, are to be found representatives of a family of Mollusca peculiar to the American continent, the Strepomatidæ (Melanians). Of this family numerous genera and many hundred nominal species have been described, but as yet we know nothing of their embryology and but little of their anatomy. With the exception of a paper on the structure of two genera by the late Dr. Stimpson, a few short notes is the sum total of our knowledge of true "soft parts." We cordially commend the investigation of the "Melanians" to the naturalists of the Mississippi basin.

The fauna of the United States is exceedingly rich in Urodelous Batrachia, and a fine field is open for a *comparative* study of their visceral anatomy and their myology. Their osteology, however, has been pretty carefully studied, though the results are not yet published in full. European embryologists have confined their studies of the development of the Batrachia to the tailless forms, while Dr. Clark is the only American who has contributed anything of any extent to our knowledge of the life history of the salamander,[1] and his observations are principally on the external changes.

The calf fish *(Amia)* of the Western rivers is a representative of

[1] The observations of Scott and Osborn should not be overlooked, though published in England.

a group of fishes of whose development almost nothing is known, and a detailed account of its embryology would have an interest and importance only excelled among the vertebrates by that of *Ceratodus*. The gar pike's development has only been studied by Mr. Agassiz, and his observations are very incomplete, though very important. A study of the development of any of the *Amiuridæ* (cat fish and horned pouts) would be very interesting and instructive, and would amply repay the person who will undertake it, while the man who investigates the method of growth of *Myxine*, so common at Eastport, will have an entirely unexplored field to himself.

The problems which we have stated are almost entirely embryological, and it is in this line of development that the most important results are to be reached. A future article will present more of the anatomical side.

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RECENT LITERATURE.

THE ZOOLOGICAL RECORD FOR 1880.[1]—This volume, the seventeenth of the series, has appeared with commendable promptness, and Mr. Rye, the editor, assures us that this rate of issue will henceforth be maintained. The recorders of the different departments are nearly the same as in the preceding volume.

It appears that the number of new genera and sub-genera contained in the present volume is 1008, as against 976 of Vol. XVI (which contained sixty new genera of *Arachnida*, properly belonging to Vol. XV, from which that group had been omitted). These are divided as follows: Mammalia, 34; Aves, 16; Reptilia, 216; Pisces, 31; Mollusca and Molluscoida, 79; Crustacea, 80; Arachnida, 78; Myriopoda, 2; Insecta, 438; Vermes, 28; Echinodermata, 24; Cœlenterata, 70; Spongida, 51; and Protozoa, 56.

The number of pages is about the same as in the preceding volume. On p. 3, Myriopoda, we notice an important error. Mr. Ryder's order *Symphyla* is spelled *Symphuta*, the name not being repeated in the note under the heading thus misspelled.

This record is of the greatest service to the systematic zoölogist, and to none more than those who are unfortunate enough not to be within reach of large libraries. Hence the American zoölogist needs the "Record," if he has no other works.

THE FISH FAUNA OF BORNEO.[2]—In Vol. XVI of the Annals of the Genoa Museum of Natural History, D. Vinciguerra com-

[1] *The Record of Zoological Literature.* London. Van Voorst. 1881. 8vo.

[2] *Annali del Museo Civico di Storia Naturale di Genova.* Vol. XVI. D. VINCIGUERRA. Appanti ittiologici sulle collezioni de Museo Civico di Genova IV. Prima contribuzione alla Fauna Ittiologica di Borneo, pp. 161–182.